

TITLE

## CONTAINER HAVING FOAM LAYER

CROSS REFERENCE TO RELATED APPLICATION

5           This application claims the benefit of U.S.  
Provisional Patent Application Serial No. 60/422,223  
filed October 30, 2002.

FIELD OF THE INVENTION

10           The present invention relates generally to a  
plastic container having a foam layer. More  
particularly, the invention is directed to a multi-  
layered plastic container including at least one layer  
of foam wherein the foam cells contain carbon dioxide.

15

BACKGROUND OF THE INVENTION

          Biaxially oriented multi-layered bottles may be  
manufactured from plastic materials such as, for  
example, polyethylene terephthalate (PET) using a hot  
20   preform process, wherein a multi-layered perform is  
heated to its desired orientation temperature and drawn  
and blown into conformity with a surrounding mold  
cavity. The multi-layered preform may be prepared by  
any conventional process such as, for example, by  
25   coinjecting a preform comprising multiple layers of  
plastic or by injecting subsequent layers of plastic  
over a previously injection molded preform. Generally,  
multiple layers are used for food or carbonated beverage

containers, to improve the oxygen or carbon dioxide diffusion barrier properties of the overall package.

The various layers of plastics in the prior art multi-layered containers are generally in intimate  
5 contact with one another, thereby facilitating the conduction of thermal energy through the walls of the containers. This allows the chilled contents of the container to quickly warm to the ambient temperature. Accordingly, such containers are often sheathed in, for  
10 example, a foamed polystyrene shell to impart thermal insulating properties to the container.

It would be desirable to prepare a multi-layered container having improved thermal insulating properties.

#### 15 SUMMARY OF THE INVENTION

Accordant with the present invention, a container exhibiting the properties set forth above has surprisingly been discovered. The container comprises:  
a first layer of plastic; and a second layer of plastic  
20 contacting the first layer, the second layer of plastic formed as a foam.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention is directed to a container  
25 comprising a first layer of plastic and a second layer of plastic contacting said first layer, said second layer of plastic formed as a foam wherein the foam cells contain carbon dioxide.

The first and second layers of plastic may be the same or different, in composition, thickness, orientation, etc. Furthermore, the invention contemplates a container having any number (greater than  
5 one) of layers of plastics, as long as at least one of the plastic layers comprises a foam. Moreover, the invention contemplates the use of a cellular foam plastic layer wherein the foam cells contain not only carbon dioxide, but also one or more other gasses.

10        Suitable plastics from which the first and/or second plastic layers may be prepared include, but are not necessarily limited to, polyesters, acrylonitrile acid esters, vinyl chlorides, polyolefins, polyamides, and the like, as well as derivatives, blends, and  
15 copolymers thereof. A preferred plastic for one or both of the plastic layers is PET.

In addition to carbon dioxide, the foam cells may contain other gases typically used in processes for making cellular foam structures, including nitrogen,  
20 argon, and the like. Preferably, the amount of carbon dioxide present in the foam cells will be greater than about ten percent by weight. The foam layer acts as an effective thermal insulator, to retard the conduction of heat energy from the atmosphere to the chilled beverage  
25 within the container.

The multi-layered container may be produced from a multi-layered preform, by conventional blow molding techniques. The cellular foam plastic layer may be

prepared coextensively with the other plastic layer by, for example, a coextrusion process, or the first plastic layer may be applied to or received by the foam plastic layer in a multi-step injection molding process.

5           Conventional processes for preparing plastic preform layers are well known in the art. The cellular foam plastic layer according to the present invention may be prepared by, for example, the polymer extrusion process set forth in U.S. Patent No. 6,284,810 B1 to  
10 Burnham et al, which is herein incorporated in its entirety by reference thereto. This patent teaches the selective injection of a supercritical foaming gas comprising carbon dioxide into the polymer through an extruder shaping die. Thus, the entire cross section  
15 and thickness of the extrudate may be foamed, or merely a portion thereof. In this way, by foaming only a portion of the thickness of the extrudate, a preform having an inner or an outer foamed layer may be produced. Alternatively, the supercritical foaming gas  
20 may be injected only at a medial annular portion of the cross section of the extrudate, thus producing a preform comprising a foamed annular core surrounded by an inner and outer "skin" of non-foamed plastic.

One ordinarily skilled in the art will readily  
25 appreciate that the number and types of plastic layers used, and the various means, chemical and physical, used to produce a foam layer, can be varied over wide limits to produce a variety of contemplated multi-layered

containers comprising a first layer of plastic and a  
second layer of plastic contacting said first layer,  
said second layer of plastic formed as a foam wherein  
the foam cells contain carbon dioxide, according to the  
5 present invention.

From the foregoing description, one ordinarily  
skilled in the art can easily ascertain the essential  
characteristics of the invention, and without departing  
from its spirit and scope, can make various changes and  
10 modifications to adapt the invention to various uses and  
conditions.